PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : F03B 3/12 — A1

(11) International Publication Number: **WO 98/17910**

(43) International Publication Date: 30 April 1998 (30.04.98)

(21) International Application Number: PCT/CZ97/00034

(22) International Filing Date: 8 October 1997 (08.10.97)

(30) Priority Data:
PV 3045-96 17 October 1996 (17.10.96) CZ
PV 972-97 28 March 1997 (28.03.97) CZ

(71)(72) Applicants and Inventors: SEDLÁČEK, Miroslav [CZ/CZ]; Pruchova 58, 150 00 Praha 5 (CZ). HOSTIN, Stanislav [SK/SK]; Mlynarovičova 11, 851 03 Bratislava (SK).

(74) Agent: ANDERA, Jiří; Rott, Ružička, Guttmann, P.O. Box 71, 142 00 Praha 4 (CZ).

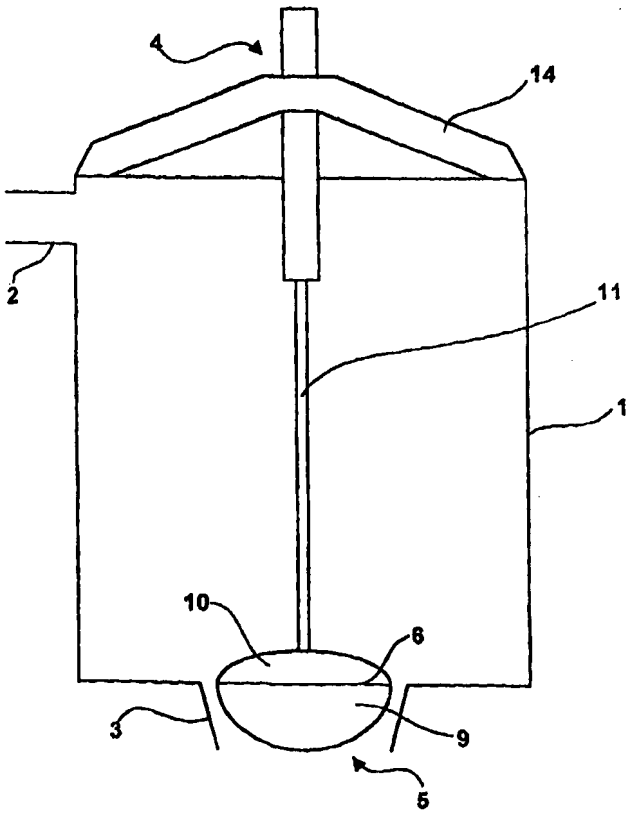
(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: ROLLING FLUID MACHINE

(57) Abstract

A rolling fluid machine comprising a fluid storage tank (1), provided with an inlet (2) and at least with one outlet nozzle (3), and in the area of the outlet nozzle (3) there is mounted, on a holding device (4), at least one rolling rotor (5) represented by a body of a rotary shape.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

ROLLING FLUID MACHINE

Technical Field

The invention relates to a rolling fluid machine which consists of a fluid storage tank provided with an inlet and at least with one outlet nozzle.

Background Art

From the Author's Certificate No. 941 665 of the former USSR there is known a hydraulic motor which consists of a rectifying channel, in which a narrowing outlet is made. In the axis of the narrowing outlet there is mounted a spherical rotor on a shaft. The rotor is connected to a starting motor.

At putting into operation, first the shaft is made turning and in this way the spherical rotor as well. The fluid stream which, in the narrowing outlet, flows round the sphere, is made rotating in this way. The rotating fluid stream keeps then the spherical rotor in rotation due to the friction between the fluid and the surface of the spherical rotor. It is necessary to stress that the spherical rotor is not rolling over walls of the narrowing outlet in any regime.

A drawback of said embodiment resides in the fact that the hydraulic motor cannot be put into operation without an auxiliary starting motor.

From another Author's Certificate No. 1701971 of the former USSR there is known an analogous hydraulic motor, where the starting motor is replaced with spiral blades mounted in the narrowing outlet.

As to said embodiment there is also not supposed that the rotor is to roll over the wall of the narrowing outlet.

In the practice there was shown that the flowing round the described type of the rotor causes unnecessary losses. That was why a more suitable embodiment of a fluid machine of a higher efficiency was in search.

Disclosure of Invention

The mentioned aim was achieved by means of a rolling fluid machine consisting of a fluid tank provided with an inlet and at least with one outlet nozzle according to this invention, the principle of which resides in the fact that in the area of the outlet nozzle there is mounted, on the holding device, at least one rolling rotor represented by a body of a rotary shape.

The rolling fluid machine according to the invention makes it possible to utilise efficiently the power of the streaming fluid which may be represented not only by a liquid, but also by gas and by mixtures of liquids and gases. A higher efficiency may be achieved especially by decreasing the resistance which arises when the rotor rolls in a fluid. The machine can work even with fluids which are very polluted with mechanical particles. Moreover an eventual exchange of worn parts is very easy.

To increase the efficiency, it is advantageous, if the rotor is separated by means of a plane of the largest diameter into two parts of different capacities, the first part of the rotor adjacent to the outlet nozzle is larger than the second rotor part which is reverse with respect to the outlet nozzle.

According to an advantageous embodiment, the capacity of the second part of the rotor may equal zero and at least a part of the surface of the first part of the rotor may be of a spherical shape.

According to another advantageous embodiment, the whole rotor may be of a spherical shape.

For a appropriate utilisation of the streaming medium, it is advantageous, if the holding device consists of an area of bearing, arranged in the outlet nozzle behind the rotor, or if the holding device consists of a shaft pivoted in a frame and holding the rotor in the axis of the outlet nozzle, and the shaft is flexible at least in a definite section.

According to another advantageous embodiment, the holding device consists of a crankshaft pivoted in a frame and holding the rotor outside the axis of the outlet nozzle.

For an easy transfer of gained power, it is advantageous, if the rotor is provided with magnets, opposite which, in the outlet nozzle, there are mounted magnetic coils, or vice versa, the rotor is provided with magnetic coils, opposite which, in the outlet nozzle, there are mounted magnets, eventually the rotor is represented by a upstream tubular-bulb type turbine with embodying generator.

In some embodiments it may be advantageous, from the kinematic point of view, to change the function of the machine, so that the rotor is mounted in a non-rotary way and the outlet nozzle is mounted in a sliding way in the plane being perpendicular to the direction of flow.

To create a pump, it is advantageous, if the rotor and a driving unit are interconnected.

Brief Description of Drawings

The rolling fluid machine according to the invention will be described in details by means of drawings, in which individual figures illustrate:

Fig. 1 - an example of an embodiment of the rolling fluid machine according to the invention

Fig. 2 - an example of an embodiment of the rotor

Fig. 3 - another example of the embodiment of the rotor

Fig. 4 - another example of the embodiment of the rolling fluid machine according to the invention

Fig. 5 - another example of the embodiment of the rolling fluid machine according to the invention

Fig. 6 - another example of the embodiment of the rolling fluid machine according to the invention

Fig. 7 - another example of the embodiment of the rolling fluid machine according to the invention adapted for gaining electric power

Fig. 8 - another example of the embodiment of the rolling fluid machine for obtaining electric power

Fig. 9 - another example of the embodiment of the rolling fluid machine for gaining electric power

Fig. 10 - the rolling fluid machine installed in a free stream

Fig. 11 - the rolling fluid machine installed in a piping

Fig. 12 - the rolling fluid machine functioning as a pump

Fig. 13 - an example of an embodiment of the rolling fluid machine according to the invention with a spherical rotor.

Modes for Carrying Out the Invention

The rolling fluid machine as in Fig. 1 consists of a metal storage tank 1 of water, provided in its upper part with an inlet 2 and in its lower part with an outlet nozzle 3 in the shape of a narrowing outlet. Onto the upper edge of the storage tank 1 there is fixed a frame l4, in which there is pivoted a shaft 11, the lower section of which is elastic. In the level of the outlet nozzle 3 there is mounted, on the shaft 11, a rotor 5 made of plastics. The rotor 5 is represented by a rotary body, the capacity of which is separated by the plane 6 of the largest diameter into two parts. The first part 9 of the rotor 5, arranged under the plane 6, is of a larger capacity than the second part 10 of the rotor 5. Fig. 13 shows an analogous embodiment which differs only in the shape of the rotor 5 which is spherical in this case.

Water supplied into the storage tank l through the inlet 2 streams from the storage tank 1 through the outlet nozzle 3, and the stream of the flowing away water causes that the rotor 5 starts to roll in a circular motion along the walls of the outlet nozzle 3. The rolling of the rotor 5 along the inner wall of the outlet nozzle 3 is made possible by the flexible part of the shaft 11. The rotary motion of the rotor 5 can be utilised for driving various tools, or it may be transferred by means of the shaft 11, e.g. to an unshown generator of electric power.

Of course, the holding device 4 may be installed also under the rotor 5, as it is shown in Fig. 5. The function of this embodiment is the same as the function of the above mentioned embodiment.

The maximum efficiency is achieved, if the capacity of the second part 10 of the rotor 5, above the plane 6 of the largest diameter, approximates to zero. The ideal example of the embodiment is illustrated in Fig. 2, according to which the rotor 5 is represented by a hemisphere, so that the capacity of the second part 10 over the plane of the largest diameter equals zero.

The first part 9 of the rotor 5 which is adjacent to the outlet nozzle 3, need not be, of course, in the shape of a hemisphere. In Fig. 3 there is shown the shape of a spherical segment. Generally, it would be sufficient that it concerns a rotary body, e.g. an ellipsoid. The second part 10 of the rotor 5, according to Fig. 3, is represented by a part of the ellipsoid. The capacity of said second part 10 of the rotor is considerably smaller than the capacity of the first part 9. Of course, the rotor 5 may be the hollow one.

In Fig. 4 there is shown an example of the embodiment of the rolling fluid machine, the holding device 4 of which consists of the area 8 of bearing which is fixed in the outlet nozzle 3 behind the rotor 5 with respect to the stream direction. The first part 9 of the rotor 5, made of plastic, is of the hemispherical shape and the second part 10 is of the shape of a part of the ellipsoid.

The rotor 5 is mounted onto the area 8 of bearing in a free way, so that it rolls over walls of the outlet nozzle 3, if the fluid passes through the outlet nozzle 3. The above described shape of the rotor 5 guarantees that the rotor 5 is orientated permanently by its first part 9 of the larger volume towards the outlet nozzle 3.

The area 8 of bearing may be readjusted as to its height by means of an readjusting device, not shown in the figure.

One of the possibilities how to utilise power obtained in such a way resides in mounting a system of magnets 12 into the rotor 5, and then, at their level, to mount a system of magnetic coils 13 in the wall of the outlet nozzle 3.

Rolling of the rotor 5 creates a relative motion between magnets 12 and coils 13, which results in inducing electric current.

Fig. 6 shows the embodiment of the rolling fluid machine according to the invention, the rotor 5 of which is carried by a crankshaft 15. The crankshaft 15 is pivoted in a frame I4, the centre of which is identical with the axis of the outlet nozzle 3. The frame I4 may be arranged either under the outlet nozzle 3 (as it is shown in Fig. 6), or over the outlet nozzle 3 (analogously as in the embodiment in Fig. 1). On the crankshaft I5 there is pivoted the rotor 5. The crank length of the crankshaft 15 is selected so that the rotor 5 may be in contact with the wall of the outlet nozzle 3, along which it rolls powered by the fluid stream, flowing through the outlet nozzle 3. The torque, acting on the crankshaft 15, can be utilised e.g. for driving a generator of electric current.

The gained power can be also utilised according to the embodiment shown in Fig. 7 (analogously as in the embodiment shown in Fig. 4) in such a way that the rotor 5 is provided with a system of the magnets 12, at the level of which, in the wall of the outlet nozzle 3, there are mounted magnetic coils 13, in which electric current is induced due to the rolling of the rotor 5.

Fig. 8 shows the embodiment analogous to the embodiment as in Fig. 7, but with the difference that the positions of the magnets 12 and of the coils 13

were mutually exchanged, so that the induced electric current is taken from the rotor 5.

Fig. 9 shows the embodiment of the rolling fluid machine analogous to the embodiment as in Fig. 6. The rotor 5 of the embodiment in Fig. 9 is represented by a so called flowed-round generator 16, the magnetic coils 13 of which, as well as the magnets 12, are mounted in the rotor 5. A quicker relative motion between the coils 13 and the magnets 12 can be achieved e.g. by means of an unshown epicyclic gear.

The storage tank 1 of all above mentioned embodiments of the rolling fluid machine according to the invention need not be represented only by a tank. Said storage tank I may be made e.g. by damming a stream of a river or of a brook, as it is shown in Fig. 10.

The storage tank 1 can be also represented e.g. by a part of a water-piping 17, as it is shown in Fig. 11. The water stream direction in the piping 17 is indicated by means of an arrow. The water stream in the piping 17 makes the rotor 5 rotating in the same way as in the above mentioned embodiments. At the same time, the water stream presses the rotor 5 to the area 8 of bearing. Electric current is induced in the magnetic coils 13 in the same way as in the above mentioned examples of embodiment.

As to the example of embodiment shown in Fig. 11, it is evident, that the rolling fluid machine according to the invention may work not only in an approximately vertical position of the axis of the outlet nozzle 3, as it is at a liquid gravitation outflow, but the axis of the outlet nozzle 3 can be orientated arbitrarily, if the fluid is supplied to the outlet nozzle 3 under a sufficient pressure.

The fluid need not be only a liquid, but the machine is functional even if the medium is represented by gas, eventually by a mixture of gases and liquids. The described examples show that the machine according to the invention can work as a source of a torque and as a generator of electric current.

This machine, though, can also work as a pump. An example of such an embodiment is shown in Fig. 12. To the shaft 11 there is connected a driving unit 18 which can be an electric motor which drives, by means of the shaft 11, the rotor 5. A part of the shaft 11 is flexible, so when the rotor 5 is rotating, it starts to roll over the wall of the outlet nozzle 3 and in this way the fluid is pumped from the storage tank 1 into a space 19. The driving unit 18 may be represented by an arbitrary motor, eventually by a manual drive with an appropriate gearing mechanism.

Of course, an expert could adapt the rolling fluid machine according to the invention in such a way that the rotor 5 is fixed and the outlet nozzle 3 rolls. As to such an embodiment the nozzle must be mounted in a sliding way in the plane being perpendicular to the direction of flow.

CLAIMS

1. A rolling fluid machine comprising a fluid storage tank (1), provided with an inlet (2) and at least with one outlet nozzle (3) **characterized by the fact** that in the area of the outlet nozzle (3) there is mounted, on the holding device (4), at least one rolling rotor (5) represented by a body of a rotary shape.

2. The rolling fluid machine as in Claim 1, **wherein** the volume of the rotor (5) is separated by the plane (6) of the largest diameter into two parts (9, 10) of different capacities, the first part (9) of the rotor (5) adjacent to the outlet nozzle (3) is larger than the second part (10) of the rotor (5), reverse with respect to the outlet nozzle (3).

3. The rolling fluid machine as in Claim 1 or 2, **wherein** the volume of the second part (10) of the rotor (5) reverse with respect to the outlet nozzle (3), equals zero.

4. The rolling fluid machine as in any of the above Claims, **wherein** at least a part of the surface of the first part (9) of the rotor (5) adjacent to the outlet nozzle (3), is of a spherical shape.

5. The rolling fluid machine as in Claim 1, **wherein** the rotor (5) is of a spherical shape.

6. The rolling fluid machine as in any of the above Claims, **wherein** the holding device (4) comprises an area (8) of bearing, arranged in the outlet nozzle (3) behind the rotor (5).

7. The rolling fluid machine as in any of the above Claims, **wherein** the holding device (4) comprises a shaft (11) pivoted in a frame (14) and holding the rotor (5) in the axis of the outlet nozzle (3), and the shaft (11) is flexible at least in a definite section.

8. The rolling fluid machine as in any of the above Claims I to 6, **wherein** the holding device (4) comprises a crankshaft (15) pivoted in the frame (14) and holding the rotor (5) outside the axis of the outlet nozzle (3).

9. The rolling fluid machine as in any of the above Claims I to 8, **wherein** the rotor (5) is provided with magnets (12), opposite which, in the outlet nozzle (3), there are mounted magnetic coils (13).

10. The rolling fluid machine as in any of the above Claims I to 8, **wherein** the rotor (5) is provided with the magnetic coils (13), opposite which, in the outlet nozzle (3), there are mounted the magnets (12).

11. The rolling fluid machine as in any of the above Claims I to 8, **wherein** the rotor (5) is represented by an upstream tubular-bulb type turbine with embodying generator (16).

12. The rolling fluid machine as in any of the above Claims, **wherein** the rotor (5) is mounted in a non-rotary way and the outlet nozzle (3) is mounted in a sliding way in the plane being perpendicular to the passage direction.

13. The rolling fluid machine as in any of the above Claims, **wherein** the rotor (5) is interconnected with a driving unit (18).

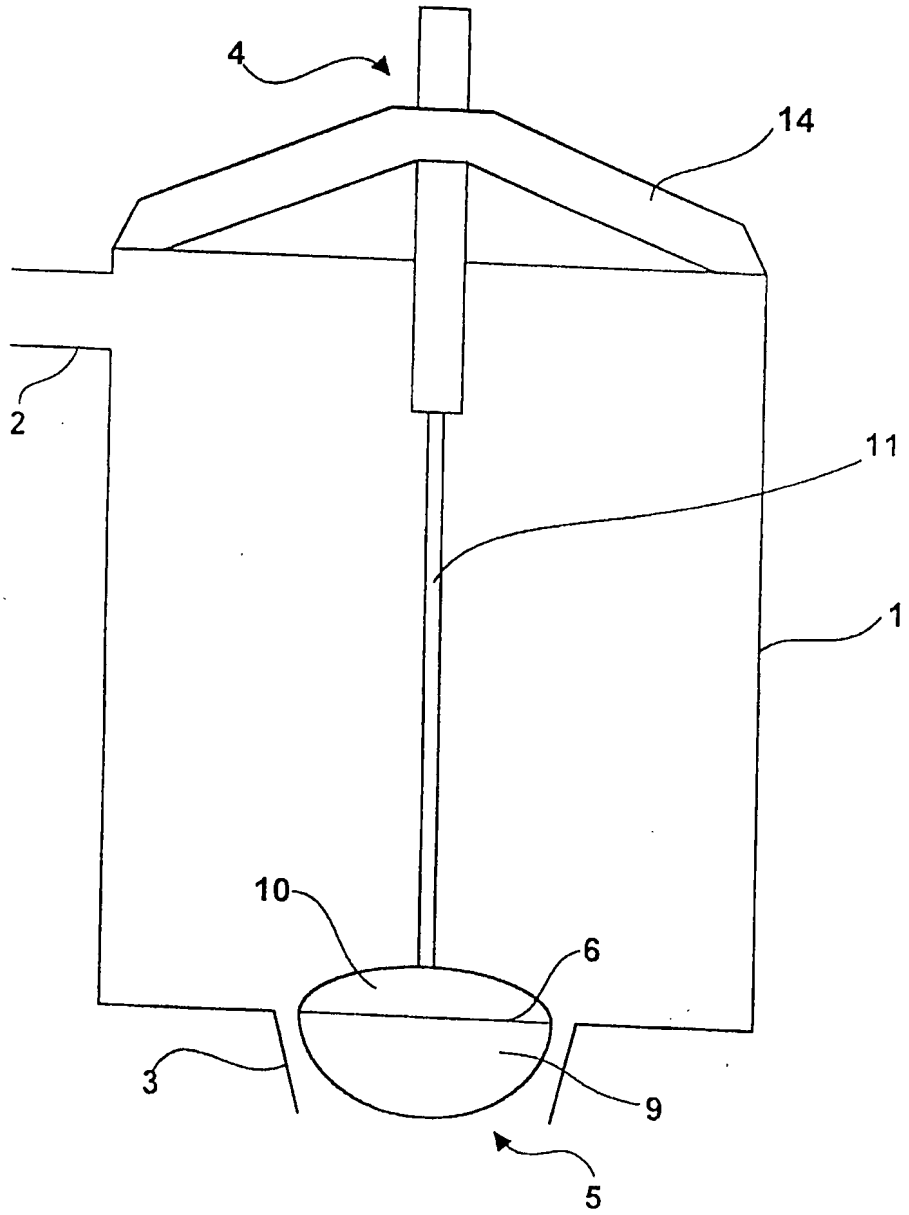


Fig. 1

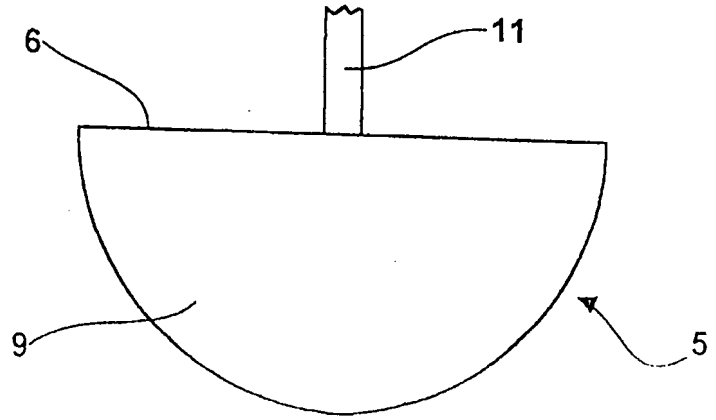


Fig. 2

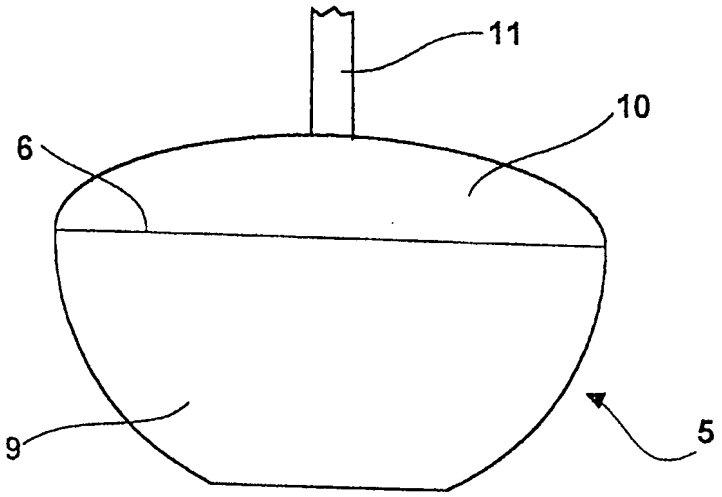


Fig. 3

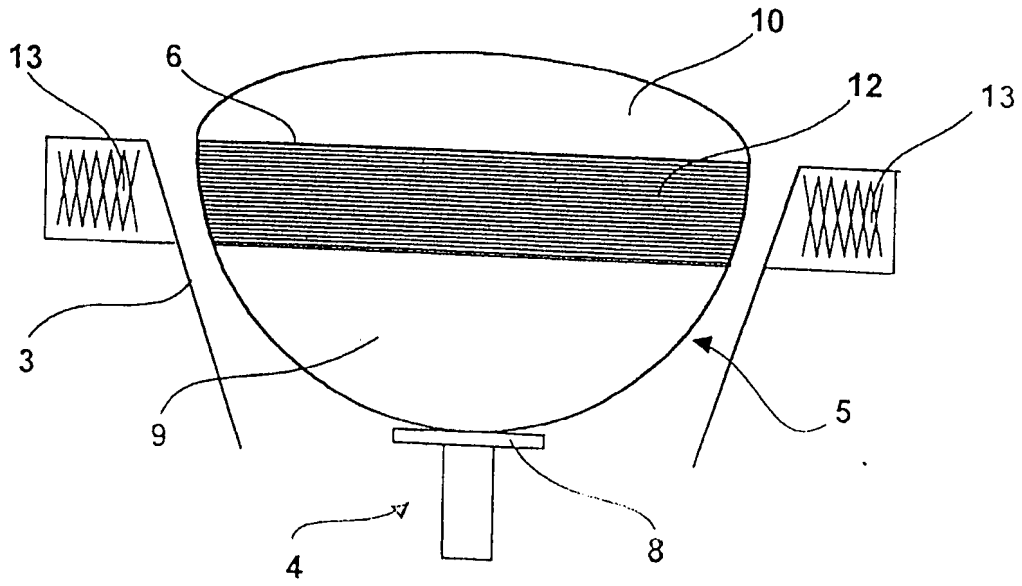


Fig. 4

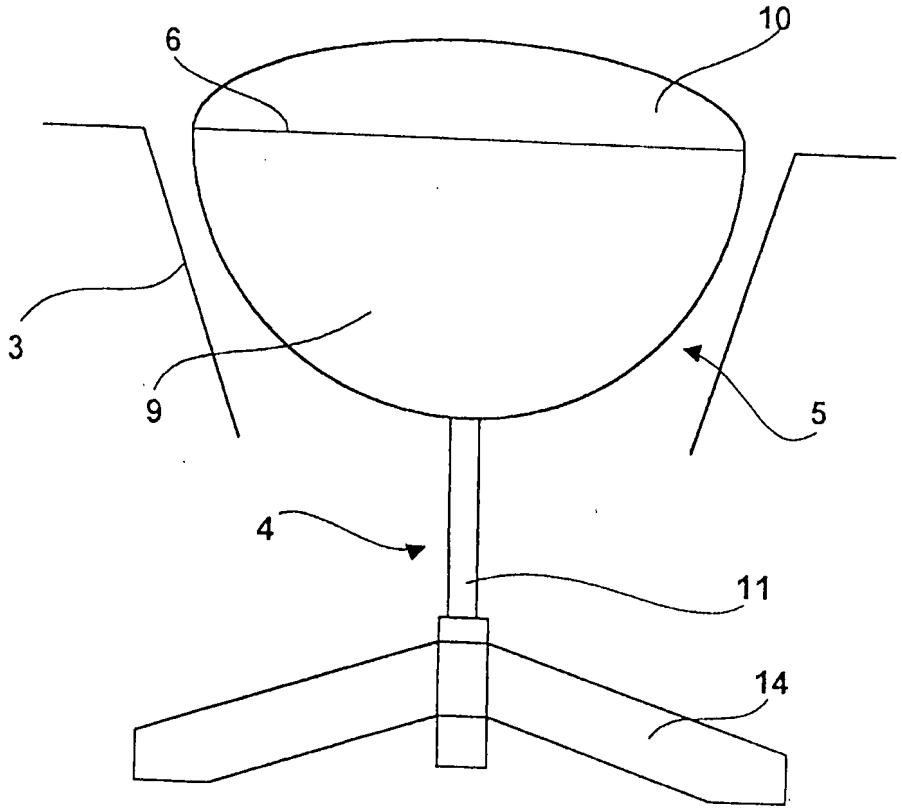


Fig. 5

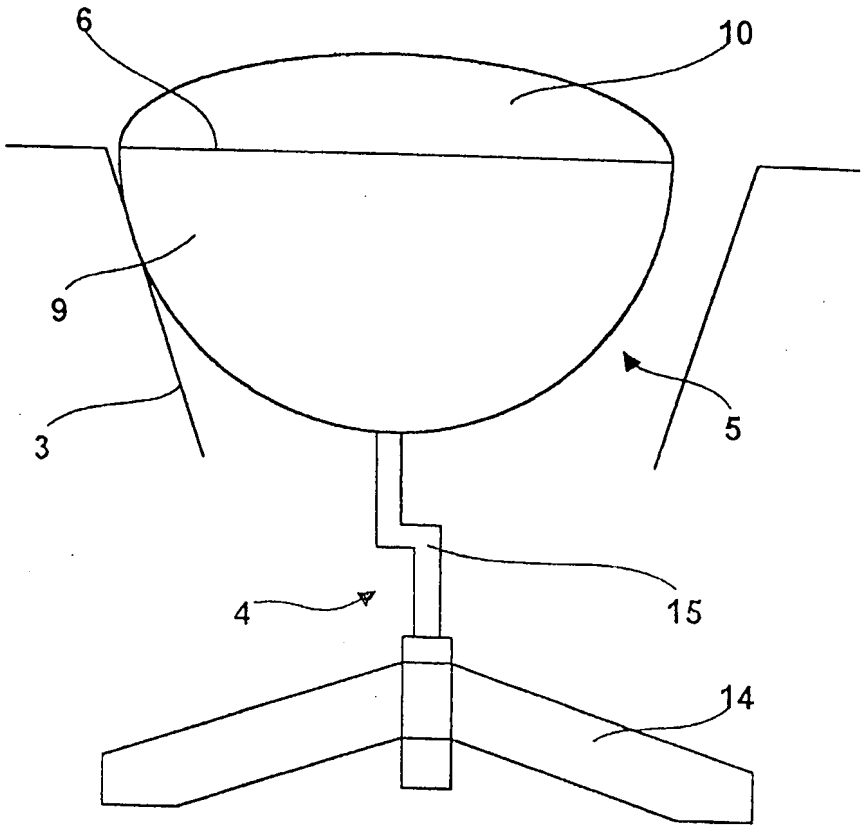


Fig. 6

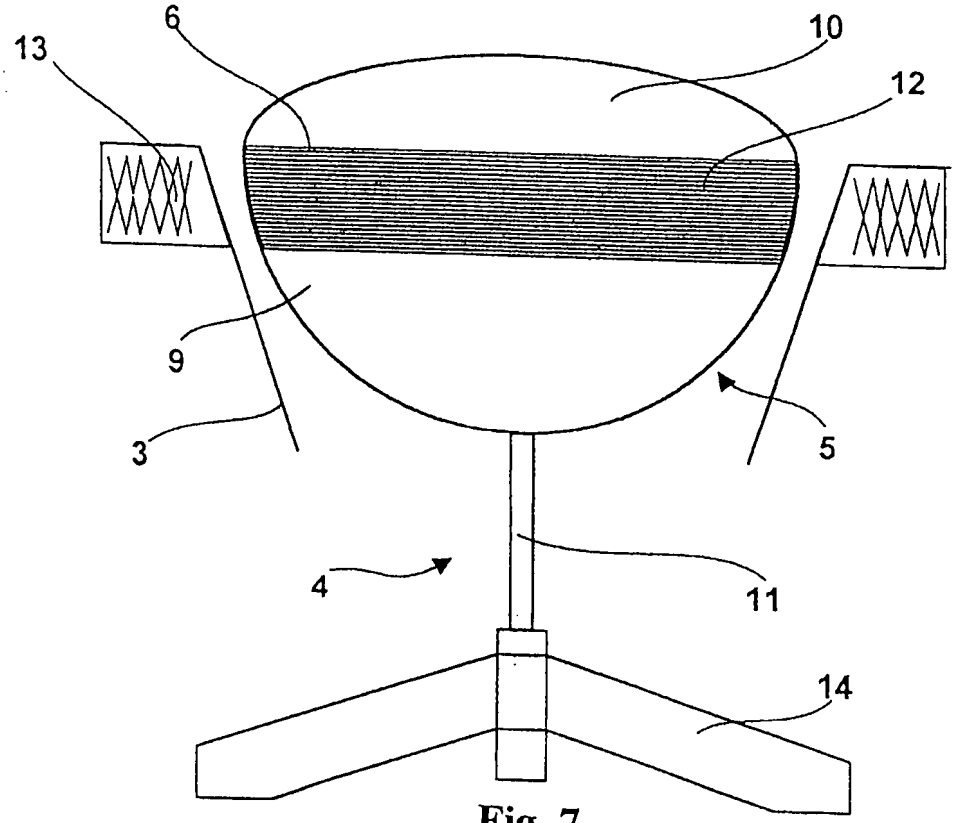


Fig. 7

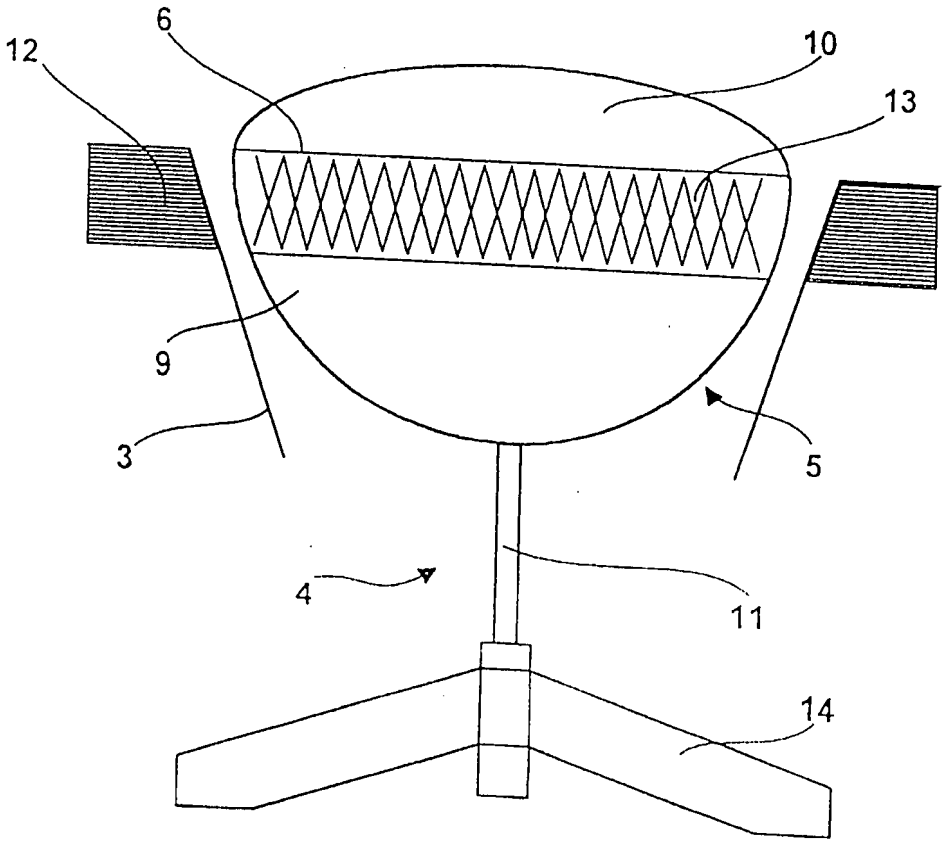


Fig. 8

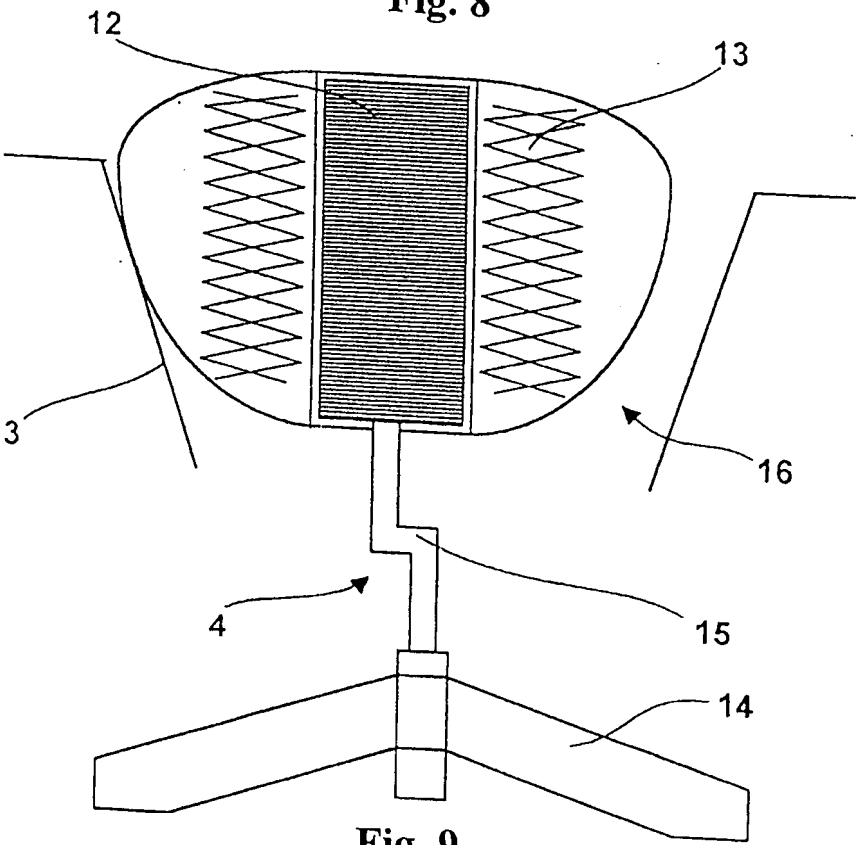


Fig. 9

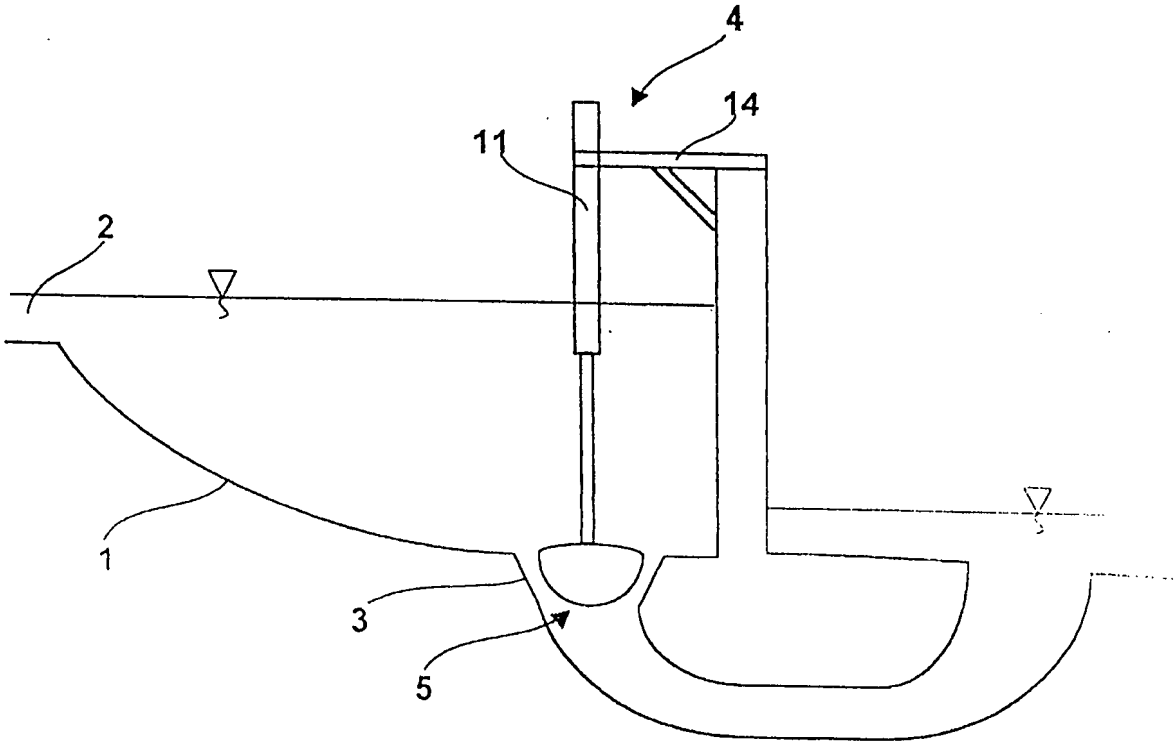


Fig. 10

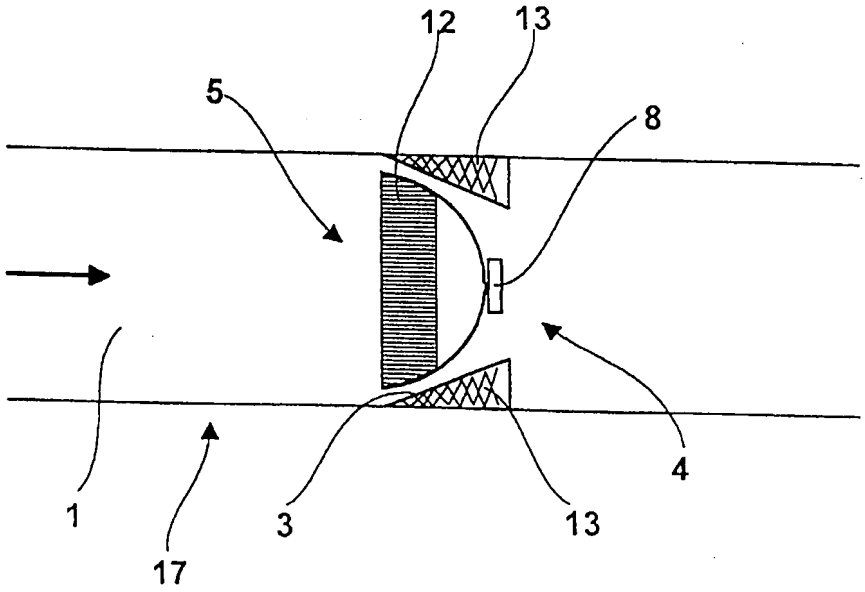


Fig. 11

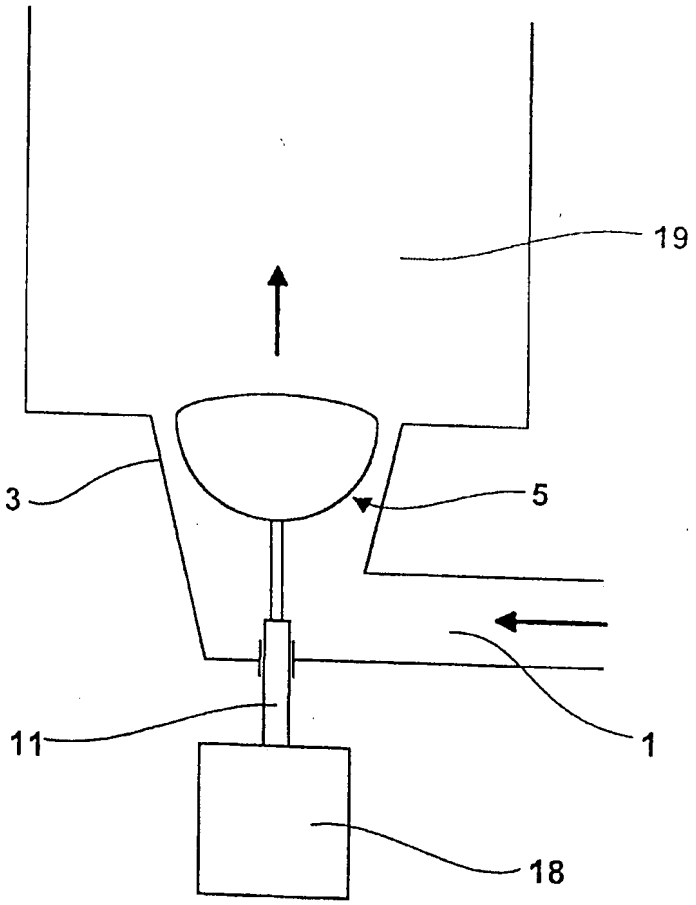


Fig. 12

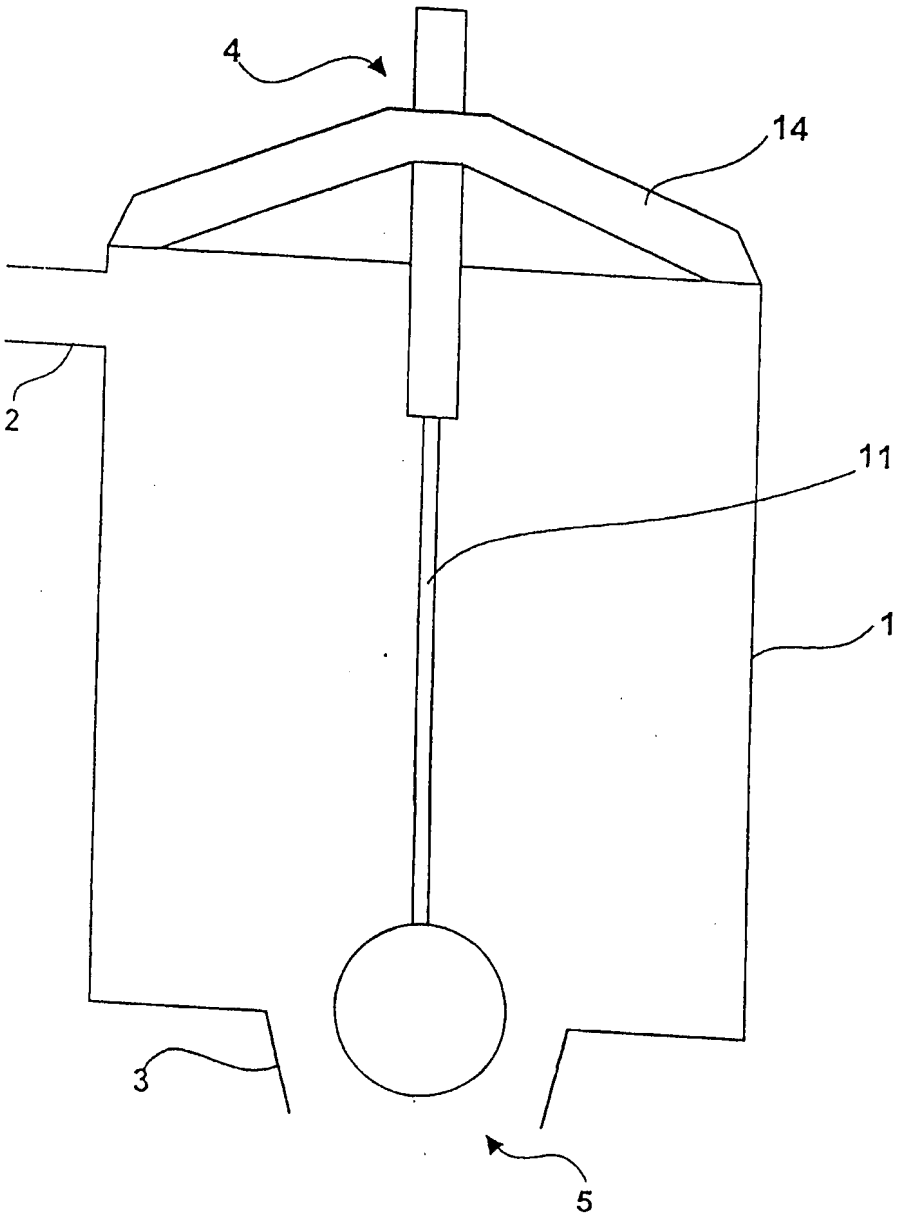


Fig. 13

INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/CZ 97/00034

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 F03B3/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 F03B F01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 542 461 A (A.BRIEUSSEL) 12 August 1922 see page 2, line 30 - line 33	1,4,6
Y	see page 2, line 24 - line 29 see figures 1,5	2,3,5, 7-11
Y	US 4 531 887 A (KLEPESCH PHILIP H) 30 July 1985 see figures 1,2 see column 1, line 58 - column 2, line 18; figures	2,7
Y	US 2 998 099 A (R.L.HOLLINGSWORTH) 29 August 1961 see column 3, line 6 - line 13; figure 4	3

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
30 January 1998	10/02/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Criado Jimenez, F

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Inte ional Application No
PCT/CZ 97/00034

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 349 274 A (R. CLOUGH) 28 May 1931 see page 1, line 78 - page 2, line 13; figures	5
Y	US 5 248 896 A (FORREST JOHN) 28 September 1993 see column 1, line 63 - column 2, line 13 see column 3, line 20 - line 53	8
Y	DE 44 25 294 A (COSMOS ENTWICKLUNG FORSCH) 1 February 1996 see claim 1; figure 1	9
Y	US 4 367 413 A (NAIR RAMON) 4 January 1983 see abstract see column 5, line 18 - line 50; figure 3	10,11
A	GB 2 195 717 A (MORGAN ROBERT LEWIS) 13 April 1988 see abstract; figures 1,3	4
A	US 2 030 560 A (J.L.ADAMS JR.) 11 February 1936 see figure 1	1
A	SU 1 701 971 A (DENISOV VIKTOR ;KAZNACHEEVA LYUDMILA V (SU); KRUGLEEVSKIJ VLADIMIR) 30 December 1991 cited in the application see figure	5
A	SU 941 665 A (ZAOCH MASHINOSTR INST) 7 July 1982 cited in the application see figure	5

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int[illegible]ional Application No
PCT/CZ 97/00034

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 542461 A	12-08-22	NONE	
US 4531887 A	30-07-85	US 4655680 A	07-04-87
US 2998099 A	29-08-61	NONE	
GB 349274 A		NONE	
US 5248896 A	28-09-93	NONE	
DE 4425294 A	01-02-96	NONE	
US 4367413 A	04-01-83	NONE	
GB 2195717 A	13-04-88	NONE	
US 2030560 A	11-02-36	NONE	
SU 1701971 A	30-12-91	NONE	
SU 941665 A	07-07-82	NONE	